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(54) **Web interfacing device**

(57) Web access functionality is embedded in a device (10) comprising a web server (14) providing access to the user interface functions for the device (10) through a device web page (18), and a network interface (12) in the device (10) enabling access to the web page (18) by a web browser (40) such that a user of the web browser (40) accesses the user interface functions for the device (10) through the web page (18).

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Figures 1a-1b illustrate a device with embedded web access functionality that provides device-specific user interface functions through a device web page;

Figure 2 shows a home-based network that enables a web browser to access the user interface functions through the device web page;

Figure 3 illustrates an example device web page for a printer device;

Figure 4 shows a large organization network or intranet that enables access to the device web pages of differing devices;

Figure 5 illustrates access to device web pages through the internet world-wide web.

Figure 1a illustrates a device 10 with embedded web access functionality that provides device-specific user interface functions. The device 10 includes a network interface 12 and a web server 14 along with a monitor 16. The network interface 12 enables communication via a communication path 22. The monitor 16 controls various device-specific functions of the device 10 and monitors a set of information pertaining to the device 10 via a control/monitor path 20. The web server 14 provides web server functions to web clients via the communication path 22. The web server 14 provides web server functions according to the Hyper-Text Transfer Protocol (HTTP).

The web server 14 receives HTTP commands through the network interface 12 that specify a predetermined Universal Resource Locator (URL) for the device 10. The HTTP commands may be used by web clients to read information from the device 10 such as device status information. The HTTP commands may also be used to transfer information to the device 10 such as information that controls the functions or operating states of the device 10. Such HTTP commands include HTTP GET, HTTP POST, and HTTP PUT commands.

In response to an HTTP command targeted for the device 10, the web server 14 generates a web page 18 that defines a set of user interface functions for the device 10. The web page 18 is a Hypertext Markup Language (HTML) file. The network interface 12 transfers the web page 18 to a requesting HTTP client via the communication path 22.

The web server 14 generates the web page 18 dynamically to reflect the updated state of the information pertaining to the device 10 that is maintained by the monitor 16. The web page 18 may also define control buttons according to the HTTP protocol that enable various control functions for the device 10 to be initiated from a web client via the communication path 22. The web page 18 may contain text, images, multimedia files, forms, tables or any object type supported by the HTTP and HTML protocols.

In addition, the web page 18 may contain one or more URLs that specify additional web pages located within the device 10. The web page 18 may also contain one or more URLs that specify additional web pages located elsewhere, i.e. external to the device 10. The additional web pages external to the device 10 may be located, for example, on a local communication network or on the internet world wide web.

The device 10 represents a wide variety of devices including devices such as printers, fax machines, copiers, communication and telephone devices, home entertainment devices such as televisions, video and audio devices as well as appliances such as refrigerators and washing machines, security systems, automobiles, and hnd lubs. The device 10 also represents a variety of measurement instruments including oscilloscopes, and spectrum analyzers and other types of measurement devices. In addition, the device 10 represents a variety of computer peripheral devices including mass storage units such as rotating media storage units.

The communication path 22 represents any communication means that is capable of transferring HTML files according to the HTTP web protocol. The communication path 22 may be realized by a wide variety of communication mechanisms including local area networks, telephone lines including cellular telephone links, serial communication links, parallel communication links, power line communication links, and radio and infrared communication links. The communication path 22 may also be a direct internet connection to the world-wide web.

Figure 1b is a hardware block diagram of the device 10. The device 10 includes a processor 200, a memory 210, a set of device-specific hardware 300 along with a set of input/output circuitry 220 that enables communication via the communication path 22. The processor 200 performs device-specific functions for the device 10 in combination with the device-specific hardware 300. The processor 200 is also employed to provide web server functionality in the device 10. In one embodiment, the processor 200 stores the web page 18 in the memory 210 which may also be used to store information associated with normal device-specific functions.

In one embodiment, the device 10 is a printer device wherein the processor 200 and the memory 210 perform image rendering functions and the device-specific hardware 300 includes printer hardware and associated circuitry and wherein the input/output circuitry 220 provides network access to the printer device 10. The web server functionality is embedded into the printer device 10 by providing software or firmware for the processor 200 and by utilizing space available in the memory 210 and by using the existing input/output circuitry 220 such as Ethernet circuitry to transfer

command via the communication path 22 and recognizes the URL contained therein.

In one embodiment, the information for the web page 18 is periodically updated by the processor 200 and is stored in HTML format in the memory 210. In such an embodiment, the processor 200 reads the web page 18 from the memory 210 in response to the HTTP command and transfers the web page 18 to the web browser 40 via the home based network 30.

In an alternative embodiment, the processor 200 generates the web page 18 on the fly in response to the HTTP command from the web browser 40. In such an embodiment, the processor 200 obtains information pertaining to the device from the device-specific hardware 300 after receiving the HTTP command and recognizing the URL contained therein. The processor 200 formats the information into the HTML format that defines the web page 18 and transfers the HTML formatted information to the web browser 40 via the home based network 30.

The HTML file is transferred according to the HTTP protocol which specifies the URL corresponding to the web browser 40. The web browser 40 receives the HTML file and renders the web page 18 on the display 42.

The following is an example HTML file that defines the web page 18 in an embodiment wherein the device 10 is a printer device.

```

<TITLE>Printer Home Page</TITLE>
<H1>home page for device 10</H1>
<HR>
The following information pertains to
the device 10 which in this example
is a printer
<table border>
<caption> Printer with a URL </caption>
<TR>
<TD>Printer Name</TD>Portdv9</TD>
</TR>
<TR>
<TD>Administrator</TD><TD>Mr. John Doe</TD>
</TR>
<TR>
<TD>Location</TD><TD>Building 1U</TD>
</TR>
</TABLE>
<P>
<A HREF = "http://www.hpssc.com"> Service Contract</A>
<P>
<A HREF = "http://www.hpsupl.com"> Supplies
ordering</A>
<P>
<A HREF = "http://www.hpl.hp.com"> Future
Products</A>
<P>
<HR>

```

Figure 3 illustrates the web page 18 for the example HTML file shown above wherein the device 10 is a printer. The web page 18 is rendered on the display 42 by the web browser 40 in response to the example HTML code set forth above. The web page 18 includes a page title 70, a header section 60, a set of ASCII text 62, a table section 64, and a set of hyperlinks 66-68.

The page title 70 is defined by the HTML (TITLE) Printer Home Page(/TITLE) coding shown above. The header

processor (200) that generates a device web page (18) wherein the device web page (18) provides a set of user interface functions for the device (10) and includes a set of information pertaining to the device (10);
 memory (210) for storing the device web page (18);
 input/output circuitry (220) that enables communication via a communication path (22) such that a web browser (40) accesses the device web page (18) via the communication path (22).

4. The device of claim 3, wherein the processor (200) receives an HTTP command via the input/output circuitry (220) and then generates an HTML file that defines the device web page (18) in response to the HTTP command.

5. The device (10) as in claims 2 or 4, wherein the HTTP command specifies a URL corresponding to the device (10).

6. The device (10) as in claim 2, wherein the HTML file contains a set of information pertaining to the device (10).

7. The device (10) as in claims 2 or 4, wherein the HTML file contains a set of URLs that control a set of predetermined functions for the device (10) wherein each URL may point to a web page (18) located internal to the device (10) or a web page located external to the device (10).

8. The device (10) as in claims 2 or 4, wherein the HTML file contains a hyperlink to an external web page that specifies additional information pertaining to the device (10).

9. A user interface method for a device (10), comprising the steps of:

generating a device web page (18) within the device (10) wherein the device web page (18) provides a set of user interface functions for the device (10);

providing access to the device web page (18) from a web browser (40) external to the device (10) such that a user of the web browser (40) accesses the user interface functions for the device (10) through the device web page (18).

10. The method of claim 9, wherein the step of generating a device web page (18) includes the step of generating an HTML file that defines the device web page (18) in response to an HTTP command received from the web browser (40).

FIG. 1A

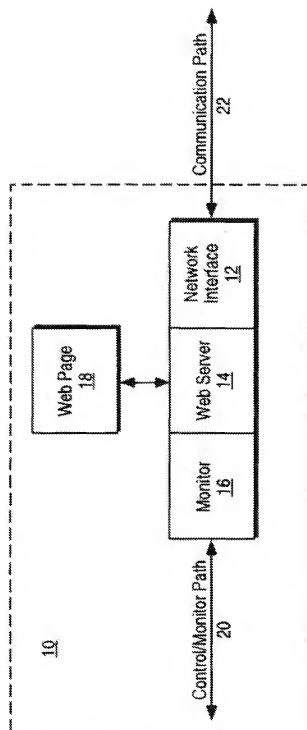


FIG. 1B

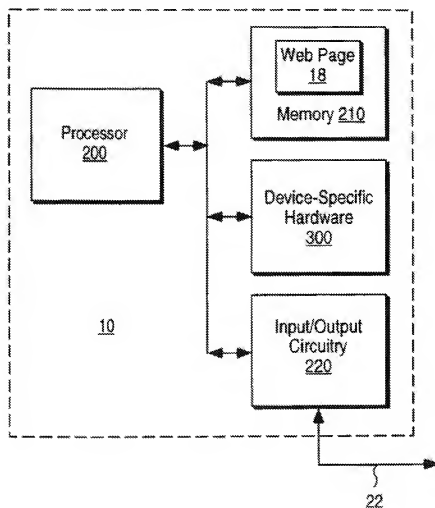


FIG. 2

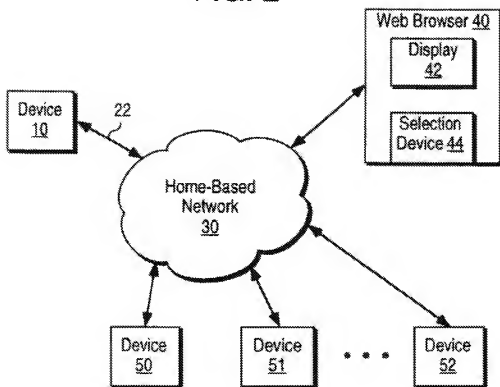


FIG. 3

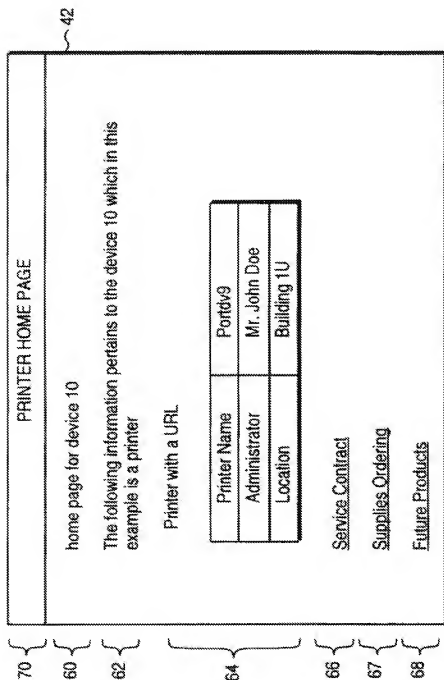


FIG. 4

